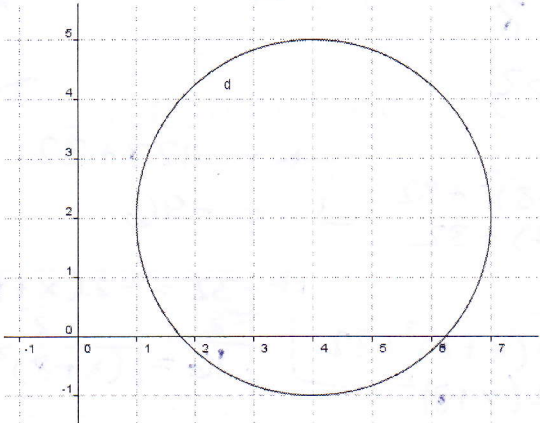
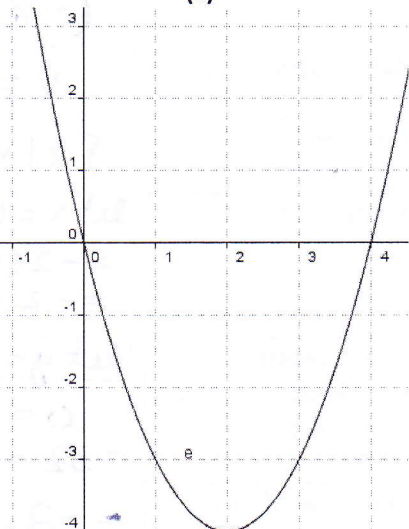


1. State whether the following is a function or not and state the domain and range for the following:

| | | |
|-------------------------------|--|--|
| <p>(a)</p> $f(x) = 3x - 5$ | <p>(b)</p>  | <p>(c)</p>  |
| D: $\{x x \in \mathbb{R}\}$ | D: $\{x 1 \leq x \leq 7, x \in \mathbb{R}\}$ | D: $\{x x \in \mathbb{R}\}$ |
| R: $\{y y \in \mathbb{R}\}$ | R: $\{y -1 \leq y \leq 5\}$ | R: $\{y y \geq -4, y \in \mathbb{R}\}$ |
| Function: y or n | Function: y or n | Function: y or n |

2. Estimate $f(4)$ for question #1c above: Ans: 0

3. Describe the transformations that would transform $f(x) = x^2$ into the following:

| Function | Transformations | Calculation |
|-------------------------------|--|---|
| $f(x) = -5x^2 + 12$ | reflection in the x axis vertical stretch by a factor of 5 vertical shift up by 12 units | Determine $f(2)$ $= -5(2)^2 + 12$ $= -8$ |
| $f(x) = \frac{2}{3}(x - 3)^2$ | vertical compression by a factor of $\frac{2}{3}$ horizontal shift to the right by 3 units | Determine $f(6)$ $= \frac{2}{3}(6-3)^2$ $= 6$ |
| $f(x) = -(x + 3)^2 - 1$ | reflection in the x axis horizontal shift to the left by 3 units vertical shift down by 1 unit | Determine $f(5)$ $= -(5+3)^2 - 1$ $= -65$ |

4. Determine if the function is linear, quadratic or neither.

a) $f(x) = 2x^4 + 2x + 10$

neither
exponent 4

b) $f(x) = 7x^2 - 3x + 9$

quadratic
exponent 2

c)

| x | y |
|----|---|
| -1 | 2 |
| 0 | 7 |
| 1 | 8 |
| 2 | 9 |

$7-2=5$
 $8-7=1$
 $9-8=1$
 $1-5=-4$
 $1-1=0$
 neither

5. For the following equation, $f(x) = -2(x + 8)^2 + 32$, determine:

| | | | |
|---|--|----------------------|---------------------------------------|
| Vertex | $(-8, 32)$ | Range | $\{y y \leq 32, y \in \mathbb{R}\}$ |
| Axis of Symmetry | $x = -8$ | Optimal Value | 32 |
| Domain | $\{x x \in \mathbb{R}\}$ | Direction of Opening | Down |
| Y-intercept | $\text{let } x = 0$ $= -2(0+8)^2 + 32$ $= -2(64) + 32$ $= -128 + 32$ $= -96$ | | |
| X-intercept(s) (also known as roots or zeroes) | $\text{let } y = 0$ $0 = -2(x+8)^2 + 32$ $-32 = -2(x+8)^2$ $\frac{-32}{-2} = \frac{-2(x+8)^2}{-2}$ $16 = (x+8)^2$ $\sqrt{16} = \sqrt{(x+8)^2}$ $\pm 4 = x+8$ $x = -8 \pm 4$ $x = -12 \text{ or } x = -4$ | | |
| The value of $f(1)$ | $= -2(1+8)^2 + 32$ $= -162 + 32$ $= -130$ | | |

6. Find the equation of the parabola that has a vertex of $(4, 16)$ and has an x intercept of 2.

$$y = a(x - 4)^2 + 16 \quad \text{sub in x-intercept } (2, 0)$$

$$0 = a(2 - 4)^2 + 16$$

$$-16 = a(2)^2$$

$$-16 = 4a$$

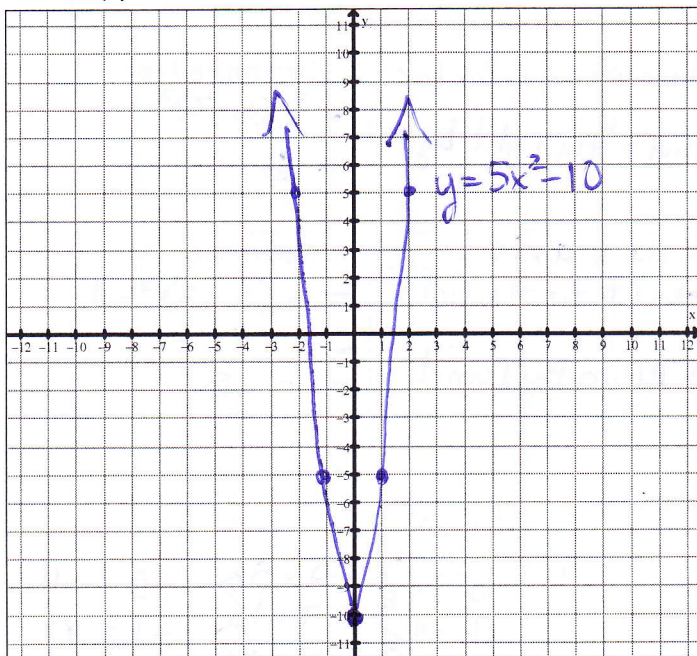
$$\frac{-16}{4} = \frac{4a}{4}$$

$$a = -4$$

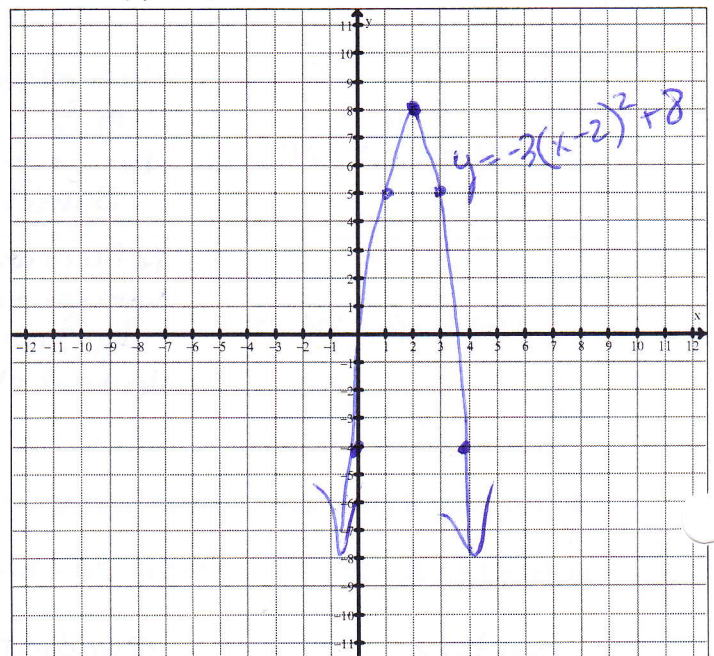
\therefore the equation is $y = -4(x - 4)^2 + 16$

7. Graph each of the following, be sure to show 5 key points.

a) $y = 5x^2 - 10$



b) $y = -3(x - 2)^2 + 8$



Vertex $(2, 8)$ SP: $-3, -9, -15$

8. A football is tossed in the air. The height, $h(t)$, in feet, after t seconds is modeled by the equation $h(t) = -5(t-3)^2 + 50$. Determine the following: (Show your steps where necessary)

a) What is the maximum height reached by the football?

Vertex (3, 50) The maximum reached by the football is 50 ft.

b) How long did it take to reach the maximum height?

It took 3 seconds to reach the maximum height.

c) State the domain and range of this function in the context of this problem.

Determine x intercepts

$$0 = -5(t-3)^2 + 50$$

$$-50 = -5(t-3)^2$$

$$\sqrt{10} = \sqrt{(t-3)^2}$$

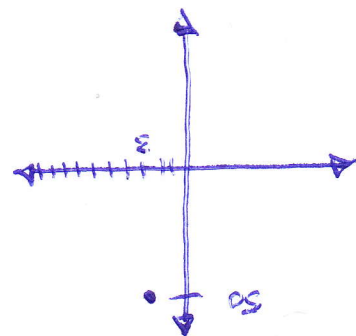
$$\pm 3.16 = t-3$$

$$t = 3 \pm 3.16$$

$$6.16$$

-0.16 object can't have negative time

Range = $\{y \mid 0 \leq y \leq 50, y \in \mathbb{R}\}$
Domain = $\{x \mid 0 \leq x \leq 6.16, x \in \mathbb{R}\}$



d) At what time will the football be at 5 ft in height?

~~$$f(5) = -5(5-3)^2 + 50$$

$$= -5(2)^2 + 50$$

$$= -5(4) + 50$$

$$= -20 + 50$$

$$= 30$$~~

$$5 = -5(t-3)^2 + 50$$

$$5-50 = -5(t-3)^2$$

$$-45 = -5(t-3)^2$$

$$\frac{-45}{-5} = \frac{-5(t-3)^2}{-5}$$

$$9 = (t-3)^2$$

$$\pm 3 = t-3$$

$$t = 3 \pm 3$$

$$x_2 = 0$$

$$x_1 = 6$$

so the football will be at 5ft at 0 sec & 6 sec.